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STATE OF ALASKA

Walter J. Hickel, Governor

ANNUAL REPORT OF PROGRESS, 1966 - 1967

FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-8

SPORT FISH INVESTIGATIONS OF ALASKA

ALASKA DEPARTMENT OF FISH AND GAME
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INTRODUCTION

This report of progress consists of findings and work accomplished under the State of Alaska Federal Aid In Fish Restoration Project F-5-R-8, "Sport Fish Investigations of Alaska."

The project during this report period is composed of 20 separate studies. Some are specific to certain areas, species or fisheries, while others deal with a common need for information. Each job has been developed to meet the needs of various aspects of the State's recreational fishery resource. Seven jobs are designed to pursue the cataloging and inventory of the numerous State waters. These are divided into logical utilization areas and are jobs of a continuing nature. It will be many years before an index of the potential recreational fishing waters is completed. Six jobs are directed toward specific sport fish studies. These include special efforts toward the anadromous Dolly Varden of Southeastern Alaska, silver salmon in Resurrection Bay, king salmon stocks on the lower Kenai Peninsula, king and other salmon stocks in Upper Cook Inlet, and Arctic grayling and sheefish in Interior Alaska. Special reports have been prepared on specific phases of the Dolly Varden life history and appear in the Department's special "Research Report" series.

The Statewide access evaluation remains one of the most important jobs conducted under this Federal Aid Program. It provides the Department with a tool to recommend withdrawal of suitable access sites on potential recreational fisheries throughout the State.

The remaining jobs include creel census efforts on specific fisheries in high use areas of the State, an egg-take program directed toward locating suitable indigenous stocks, perfecting advanced techniques in taking, handling and rearing species that are not normally associated with standard fish cultural practices, and continuation of the evaluation of the Fire Lake System.

The material contained in this report is often fragmentary in nature. The findings, evaluations and interpretations contained herein are subject to re-evaluation as the work progresses and additional data are collected.

Volume 8 Report No. 9-B

RESEARCH PROJECT SEGMENT

STATE: ALASKA

Name: Sport Fish Investigations of Alaska.

Project No: F-5-R-8

Title: Population Studies of Anadromous Species with Emphasis on Upper Cook Inlet Drainage.

Job No: 9-B

Period Covered: March 16, 1966 to March 15, 1967

ABSTRACT

The Alaska Board of Fish and Game reopened king salmon Oncorhynchus tshawytscha, sport fishing in selected freshwater areas of Cook Inlet. To control the catch, a punch card system was selected by the Board. Of the 8,851 king salmon punch cards issued, 77 percent were returned to the Department of Fish and Game.

Creel census data taken during the special king salmon punch card fishery disclosed that 660 anglers fished 5,280 hours to catch 263 king salmon over 508 mm (20 inches), a seasonal rate of success of 0.05 fish per hour.

A sample of 64 king salmon over 508 mm in fork length checked for age indicated that 17 percent were 6 years old, 42 percent were 5 years old, and 41 percent were 4 years old.

A total of 166,870 king salmon smolts weighing 98 to the pound was marked with a half-dorsal fin clip and released into Ship Creek.

Creel census data disclosed that 907 anglers fished 3,106 hours to catch 1,069 silver salmon O. kisutch, in four streams on the west side of the Susitna River, a seasonal rate of success of 0.34 fish per hour.

RECOMMENDATIONS

1. That this study be continued.
2. That local streams in the Anchorage area be used as a source for the procurement of king salmon eggs for experimental rearing and release into Ship Creek.
3. That periodic visits be made to Cook Inlet salmon canneries to locate fin-clipped fish, and to obtain size and sex composition of incidental-caught king salmon taken in the commercial fishery.

OBJECTIVES

1. To determine the sport fish catch of king salmon and evaluate angling pressure in the fresh waters of Upper Cook Inlet.
2. To conduct silver salmon harvest studies in the Susitna River Drainage.
3. To determine the distribution, abundance, time of arrival, age growth, sex ratios and spawning areas of adult king salmon and silver salmon in the various streams of Upper Cook Inlet.
4. To provide data on post-spawning, incubation and emergence of king salmon smolts.
5. To evaluate the Fort Richardson and Elmendorf Air Force Base Cooling Ponds' contribution to the anadromous fish stocks in Ship Creek.

6. To investigate Ship Creek and South Fork Eagle River in the Anchorage area as a source for the procurement of king salmon eggs for experimental hatching and rearing.

TECHNIQUES USED

Creel census was undertaken during the king and silver salmon season to accumulate data on angling harvest.

Aerial, riverboat and ground surveys were made to observe distribution, number, and time of arrival of adult king salmon in Upper Cook Inlet.

King and silver salmon scales were prepared using the plastic impression method, and age analysis was determined by Department personnel.

Lengths, sex composition and scales from king and silver salmon were obtained during creel census checks on the fisheries.

An electrical shocking device and a 100 by 8-foot gill net with 5-1/4-inch stretch mesh was used in capturing adult king salmon.

FINDINGS

Past information collected on this project and a description of the Upper Cook Inlet area are presented in Dingell-Johnson Project Reports by Stefanich (1961) and Kubik (1962, 1963, 1964, 1965).

History

Sport and commercial fishing for king salmon was prohibited during 1964 and 1965 in an attempt to rebuild the king salmon stocks in Cook Inlet. The history of the Cook Inlet king salmon fishery prior to 1965 has been presented in Volume 5, Job No. 9-B, Dingell-Johnson Reports, State of Alaska, 1963-64.

In December 1965, the Alaska Board of Fish and Game adopted a proposal to allow sport fishing for king salmon in the saltwater areas of Cook Inlet. However, in April 1966, a proposal to grant a limited sports fishing season for king salmon in selected freshwater streams of the Cook Inlet area was approved instead. The amended proposal allowed fishing for king salmon in designated streams from May 28 through July 26 with the open season being limited to Saturdays, Sundays, and Memorial Day. The Board opened four streams in the Upper Inlet and four streams in the Kenai Peninsula areas. A quota of 500 kings over 20 inches in the Kenai area and 250 kings over 20 inches in the Upper Inlet area was established.

Punch Card Fishery

For the first time Alaska salmon anglers were required to record catches by areas and dates on salmon punch cards similar to those used by the states of Oregon and Washington.

A total quota of 250 king salmon over 508 mm (20 inches) for all streams was established for the Deshka River, Lake Creek, Chunilna Creek, and Alexander Creek in the Upper Inlet area. The limit was set at one king salmon per day, and two king salmon over 508 mm in length per season. King salmon under 508 mm were included in the general daily freshwater bag limit.

During the Cook Inlet special season, all persons, including those under 16 years of age, were required to have in their possession while king salmon sport fishing a king salmon punch card. Upon landing a king salmon 508 mm or over in length, one punch was completely removed from the card and the area and date the fish was caught was entered in the corresponding space (Figure 1).

A total of 8,853 king salmon punch cards was issued to anglers in the entire Cook Inlet area during the 1966 season. Seventy-seven percent were returned to the Department of Fish and Game.

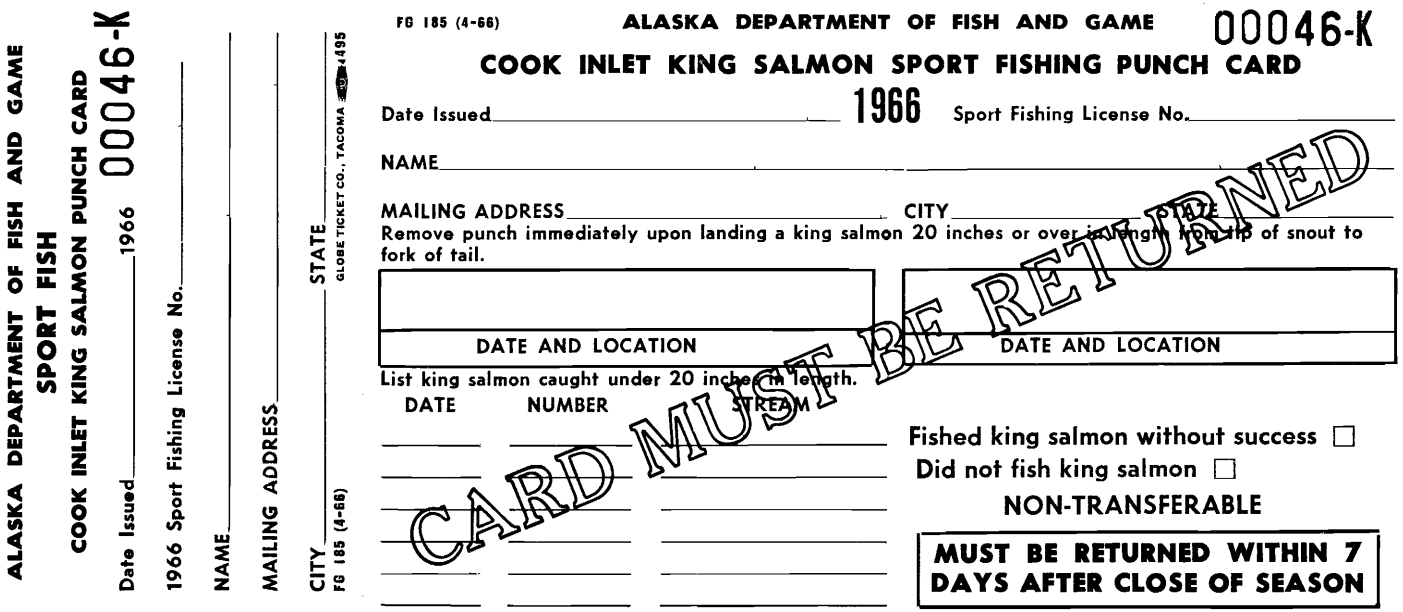

Figure 1. State of Alaska King Salmon Punch Card, Side 1.

The 1966 recorded catch of king salmon for Upper Cook Inlet streams was 426 fish, with 38 percent under 508 mm. Table 1 shows the catch of king salmon over 508 mm by area and date. Creel census data disclosed that 660 anglers fished 5,280 hours to catch 263 kings over 508 mm, a seasonal rate of success of 0.05 fish per hour.

TABLE 1 - Catch of King Salmon, 508 mm (20 inches) and Over for Four Streams in Upper Cook Inlet, 1966.

Date	Deshka River	Alexander Creek	Lake Creek	Chunilna Creek	No. of Kings
5/28	6				6
5/29	6	1			7
5/30	9				9
6/4	5				5
6/5	0				0
6/11	8	3			11
6/12	14	2			16
6/18	63	5	6		74
6/19	33	5	4		42
6/25	44	5	4	2	55
6/26	17	5	14	2	38
TOTAL	205	26	28	4	263
Percent	78.0	9.9	10.6	1.5	100

The most productive stream for anglers was the Deshka River where 78 percent (205) of the king salmon catch 508 mm and over was taken. Sixty-one percent (403) of the total anglers checked during the special punch card fishery fished the Deshka River; 121 anglers caught 1 king, and 51 fishermen successfully limited-out with 2 kings over 508 mm per season.

A total of 122 king salmon over 508 mm in length ranged from 508 mm to 1,117 mm with an average of 742 mm. Of these, 52 percent were between 508 mm and 635 mm. A total of 87 "jack" kings under 508 mm had an average length of 380 mm and a range of 280 mm to 505 mm.

Scale samples were collected from 115 king salmon caught during the punch card fishery. Thirty percent showed regeneration and were eliminated from the sample. Age was determined for 64 king salmon over 508 mm; composition of the sample indicated 41 percent age 1.2 year, 42 percent age 1.3 year, and 17 percent were 1.4 year old fish. Scale samples of 21 kings under 508 mm were read as age 1.1.

Timing

The timing of the escapement into most of the Susitna River tributaries is difficult to determine because of glacial and turbid water conditions. King salmon generally enter streams of the lower basin during the latter part of May, which is the usual time for the ice to go out in the Big Susitna River and its tributaries. Unless a fish is observed near the surface of the water, the only other method for detecting arrival of the early kings is by test nets and hook and line.

The first king salmon caught in the Deshka River was taken by gill net on May 26. Adult king salmon were caught at the confluence of the Deshka River and the Susitna River until July 8, at which time sampling by nets had to be discontinued due to large runs of pink salmon O. gorbuscha.

In Alexander Creek, the first king salmon observed was caught on May 29 during the punch card fishery.

King salmon were observed in the Talkeetna River area during the second week in June; king salmon were caught at the confluence of Chunilna Creek and the Talkeetna River by hook and line on June 25.

King salmon were caught at Fish Creek above Lake Creek on June 14, and the first salmon caught by rod and reel in Lake Creek was taken on June 18.

In the upper Yentna-Kichatna River area, king salmon were captured in gill nets on June 28.

Test Fishing--Gill Net

Test net sampling was used to obtain general information relative to distribution, timing, length frequencies, age and sex composition. One 8- by 100-foot gill net with 5-1/4-inch stretch mesh was used in sampling the run at the confluence of the Deshka and Susitna Rivers. Captured king salmon were measured, sexed, and then tagged with a Peterson disc tag before being released into the Deshka River.

The fork lengths of 114 fish caught ranged from 482 mm to 1,219 mm (Table 2). The mean length was 699 mm compared to 774 mm in the 1965 test net fishing. The average length of the females was 864 mm in 1966 and 874 mm in 1965. Males averaged 657 mm in 1966 compared to 731 in 1965. Fifty-seven percent of the salmon measured in 1966 were under 635 mm. The most prevalent size group was from 558 to 658 mm, of which 98 percent were males. The sex ratio of males to females was 3.8:1.

Although several tagged king salmon were observed and hooked by anglers on the upper reaches of the Deshka River, no marked kings were observed by the recovery crew during their stream surveys.

TABLE 2 - Length Frequency Distribution, by Sex, of King Salmon Sampled at the Test Net Site, Deshka River, 1966.

Length (mm)	Number of Fish Male	Number of Fish Female	Total
457 - 505	1		1
508 - 556	8		8
558 - 607	40		40
609 - 658	23	2	25
660 - 708	1	2	3
711 - 759		1	1
762 - 810	1		1
812 - 861	3	8	11
863 - 912	5	3	8
914 - 962	4	2	6
965 - 1013	1		1
1016 - 1064			
1066 - 1115	1	3	4
1117 - 1166	1	2	3
1168 - 1216	1		1
1219 - 1267	1		1
TOTAL	91	23	114

Escapement

The Susitna River and many of its tributaries are glacial or so murky that any index to escapement is difficult to determine by visual methods. Only the clear tributaries, where fish could be seen, were surveyed by air and foot; gill nets were used in some of the glacial and more turbid streams to determine if they were used by salmon.

Escapement counts in 1966 were slightly lower than those in 1965, with 4,012 king salmon being enumerated in 26 streams. An additional 426 king salmon taken in the sport fishery would increase the total to 4,438 (Table 3). During 1965, 4,742 king salmon were enumerated in 30 streams.

TABLE 3 - High Counts of King Salmon in Some of the Tributaries of Upper Cook Inlet, 1966.

Stream	1966	1965
Alexander Creek	300*	400
Byers Creek	---	4
Campbell Creek	15	119
Chunilna Creek	300*	8
Chuit River	200*	1
Deshka River System	2,000*	2,749
Little Willow	38	3
Montana Creek	100	57
N. F. Kashwitna	2	3
Peters Creek	---	101
Prairie Creek	153	30
Sheep Creek	100	3
Ship Creek	50	207
S. F. Eagle River	49	159
Talachulitna River	15	69
Willow Creek	103	35
Lake Creek System	300*	172
Sucker Creek	51	16
Deshka River **	114	509
Indian Creek **	---	1
Gagnon Creek **	---	13
Moose Creek **	5	25
Unnamed Creek **	---	2
Quig Creek	---	53
Little Susitna River	---	3
Kichatna River **	4	---
Donkey Creek **	3	---
Wasilla Creek	8	---
Fish Creek	74	---
Croto Creek (Fish Creek) **	8	---
Caswell Creek	1	---
Theodore Creek	11	---
Quig Creek **	8	---
Total	4,012	4,742
Sport Fishery	426	none
TOTAL	4,438	4,742

* Estimate
** Test Net

Streams on the east side of the Susitna showed some increase in escapement during 1966. Table 4 shows the escapement counts for these streams from 1961 through 1966.

The higher counts in 1966 may be attributed to: (1) effects of the closure, allowing more fish to reach the spawning grounds; (2) more intensive ground surveys; (3) streams were lower and clearer, improving visual conditions.

TABLE 4 - The Highest King Salmon Escapement Counts on Four East Side Susitna River Streams During 1961 through 1966.

Stream	1961	1962	1963	1964	1965	1966
Little Willow Creek	112	26	11	7	3	38
Montana Creek	65	75	23	75	57	100
Sheep Creek	70	35	24	*	3	100
Willow Creek	170	71	55	51	35	103

* Count not made due to high water.

Three streams in the Anchorage area showed a marked decline in numbers in 1966, compared to the previous four years of enumeration counts (Table 5).

TABLE 5 - The Highest King Salmon Escapement Counts on Three Anchorage Area Streams from 1962 through 1966.

Stream	1962	1963	1964	1965	1966
Campbell Creek	40	187	116	119	15
Ship Creek	58	119	94	207	50
S. F. Eagle River	*	135	123	159	49

* No count.

The low counts in 1966 could be attributed to: (1) changes in stream habitat due to man-created activities; (2) poaching--there was an abundance of illegal fishing activity in the Anchorage area.

The Deshka River is the largest clearwater tributary in the Cook Inlet area and supports the largest king salmon runs in the Susitna River Basin (Table 6).

TABLE 6 - Minimum Escapement Counts and Sport Fish Catch Records for the Deshka River, 1961 through 1966.

Year	Escapement	Sport Fish Catch
1961	18**	91
1962	998	142
1963	131	758
1964	2,422	No Fishery
1965	2,749	No Fishery
1966	2,000	308*

* Punch card fishery
** Inadequate tower count, no stream survey attempted

The Deshka has maintained a substantial run of kings, and has provided the sports angler with good fishing because of several factors: (1) the early run of kings is in the Deshka before the commercial fishery has begun in late June; (2) the river is accessible only by boat and float plane; (3) there are no residents on the stream (no permanent dwellings); (4) the stream is monitored closely by Fish and Game personnel.

Carcass Counts

In conjunction with enumeration of spawners, all carcasses encountered on the Deshka River were examined for sex and size composition. Dead fish were measured from tip of snout to fork of tail (fork length) and each fish examined for sex and spawning success. All fish checked were marked with a knife slash across the caudal peduncle to prevent duplication of data on later surveys. The 164 king salmon carcasses measured ranged from 292 mm to 1,168 mm; males averaged 775 mm while females averaged 912 mm. Twenty-two percent of the dead salmon were under 635 mm. The ratio of males to females was 1.6 to 1 (Table 7).

TABLE 7 - Fork Length Frequency Distribution of King Salmon Found Dead on Spawning Grounds, by Sex, Deshka River, 1966.

Length (mm)	Male	Female	Combined
254 - 302	1		1
305 - 353	5		5
355 - 404			
406 - 455			
457 - 505	1		1
508 - 556	3		3
558 - 607	16		16
609 - 658	12		12
660 - 708	5		5
711 - 759	1	1	2
762 - 810	6	4	10
812 - 861	8	8	16
863 - 912	6	20	26
914 - 962	16	9	25
965 - 1013	7	10	17
1016 - 1064	6	8	14
1066 - 1115	2	3	5
1117 - 1166	5		5
1168 - 1216	1	—	1
TOTAL	101	63	164

King salmon under 635 mm (25 inches) in length were difficult to identify due to the thousands of pink salmon carcasses strewn on the banks and stream bottom. Numerous fish had to be examined closely to distinguish between "jack" kings and pink salmon. This kind of scrutiny sometimes involved the separation of dozens of salmon in large piles and undoubtedly several small kings went unobserved.

King Salmon Egg Take

An attempt was made to obtain king salmon eggs from spawning adults in three Anchorage area streams (Table 8). Egg take activities commenced on July 18 and terminated on August 5. Department personnel and conservation agents from Fort Richardson used gill nets and electrical shocking devices to capture 73 adult king salmon. Several of the female kings were found to be partially spawned, indicating earlier spawning activity. A total of 111,000 eggs was obtained from 35 females with an average of 3,170 eggs per fish. This low average is indicative of earlier spawning activity and the average number of eggs per female would have been substantially higher had the salmon been taken at time of peak maturation.

TABLE 8 - Streams in the Anchorage Area Where King Salmon Were Captured for Artificial Spawning, 1966.

Stream	No. of Males	No. of Females
Ship Creek	22	24
S. F. Eagle River	15	10
S. F. Campbell Creek	1	1
TOTAL	38	35

Fort Richardson Cooling Pond

Since 1963 king salmon have been reared to smolt size in the Fort Richardson Cooling Pond and released into Ship Creek. A description of the pond is presented in Volume 4, Job No. 9-B, Dingell-Johnson Report, 1962-63, State of Alaska.

A total of 228,000 king salmon eggs was obtained from Green River, Washington, in November, 1965, and hatched at the Fire Lake Hatchery near Anchorage. The king salmon fry were 194 to the pound when transferred to the Fort Richardson Cooling pond in early June of 1966. The salmon were reared at the pond for one month before being marked with a half-dorsal fin clip and released into Ship Creek. A total of 166,870 kings weighing 98 to the pound was liberated.

During October, minnow traps were deployed in Ship Creek to determine if any of the Green River fin-clipped kings released during July from the cooling pond were still present in the area. Both fin-clipped and unmarked king salmon parr were caught. The average size for a sample of 50 fish was 76 mm, with a range of 63 to 82 mm. During the month of November, no small fish were observed or collected. It was apparent that the fish moved downstream because of increased water flow from the Chugach Dam reservoir which had reduced the water temperature from 48° to 33° F.

Collections made during October on the lower area of Ship Creek, some 3.5 miles upstream from salt water, resulted in small catches of king salmon parr averaging 64 mm. No marked kings were caught.

Discharge water from the Elmendorf Air Force Base steam plant increased the water temperature in this portion of Ship Creek; the average temperature for October was 46° F.

Silver Salmon

Cook Inlet is the major freshwater silver salmon fishing area in Alaska in angler participation and total catch. Silver salmon enter most of the upper Cook Inlet area streams in mid-July and may continue to run well into October. Comparative harvest data from Sport Fish catch records and Commercial Fish catch statistics indicate strong runs of silvers occurring on even years.

During 1966, four streams on the west side of the Susitna River were checked for angling pressure and harvest. These streams are accessible to the angler by boat and plane only. Creel census data disclosed that 907 anglers fished 3,106 hours to catch 1,069 silver salmon, a seasonal rate of success of 0.34 fish per hour. Table 9 shows by stream, the number of anglers contacted in 1966 and their harvest of silvers. Ninety-eight percent of the silvers caught on the west side streams were taken between July 23 and August 7.

TABLE 9 - Silver Salmon Catch on Four West Side Susitna River Streams, 1966.

Stream	Number of Anglers	Number of Silver Salmon
Alexander Creek	431	553
Deshka River	375	353
Lake Creek	84	105
Quig Creek	17	58
TOTAL	907	1,069

Table 10 shows the minimum catch records taken by creel census from 1961 through 1966.

TABLE 10 - Sport Fish Catch of Silver Salmon, Upper Cook Inlet, 1961-66.

Year	Number Silvers	Year	Number Silvers
1961	269	1964	1,054
1962	1,986	1965	504
1963	744	1966	2,308

Silver salmon in upper Cook Inlet tend to be small fish. The average weight for silvers is about 4 to 5 pounds; a fish weighing over 10 pounds is uncommon.

The 647 silvers measured ranged from 406 mm to 711 mm with an average of 587 mm. Male silver salmon taken in the sport fishery averaged 599 mm while females averaged 581 mm. The ratio of males to females was 1:1.

Cook Inlet silver salmon are normally four-year fish. Scales were checked from 339 salmon to obtain age data. One hundred and six scales showed regeneration and were not used. Seventy percent (163) were read as 2.1, and 30 percent (70) as 1.1 age fish.

Silver salmon are also taken in the commercial fishery. Since 1960, 39 percent of the Inlet's silvers have been taken in the Northern District (Figure 2). These fish are bound for the Susitna River drainage. Table 11 shows the silver salmon commercial catch for the Northern District of Cook Inlet from 1960 through 1965, Rearden (1965).

TABLE 11 - Commercial Fish Catch of Silver Salmon, Cook Inlet and Northern District Area, 1960-65.

Year	Cook Inlet	Northern District
1960	314,153	144,377
1961	119,397	40,975
1962	358,051	172,562
1963	203,876	63,540
1964	462,114	167,928
1965	113,008	18,518
TOTAL	1,570,599	607,900

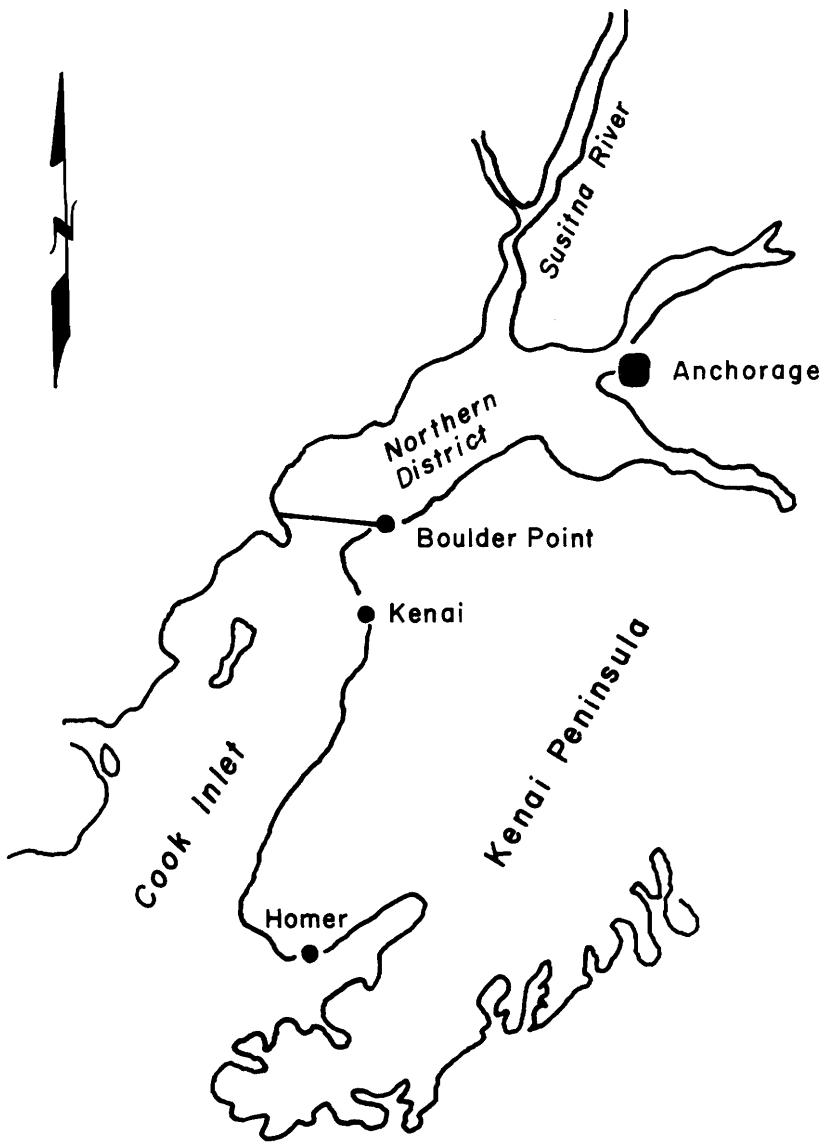

Figure 2. Cook Inlet, Showing the Northern Commercial Fishing District.

With the ever increasing demand for salmon by both the sport and commercial fisheries, it is only logical that if a compatible and successful silver salmon fishery is to continue, basic research, such as angling pressure, harvest, and a more complete knowledge of the spawning population is needed now, in order to formulate a wise management course.

LITERATURE CITED

Rearden, Jim. 1965. Status of the Cook Inlet-Resurrection Bay Commercial Salmon Fishery, Alaska Department of Fish and Game Informational Leaflet 69, pp 32-33.

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